Instructions for Building a Lesson Plan

Lesson plans, such as the ones used for the National GED Mathematics Training Institute, were developed using a format similar to that found on the *Illuminations* website hosted by the National Council of Teachers of Mathematics (NCTM). Those lesson plans were developed to provide teachers with an opportunity to go beyond the usual workbook or small-group activity to a discovery-oriented process where students explore and discover ideas independently of the teacher. The teacher takes on the role of facilitator rather than dispenser of knowledge. This approach to teaching mathematics is common in the K–12 program, but is seldom found within adult education.

While it may take a little time to adjust to using this type of approach, the benefit to students is well worth the effort. Teachers may also be challenged by adult education students as to why they have to do their work this way rather than just "being told" what to do. With time, students, with their natural curiosity, will begin to see benefits as well. Discovery-based lessons provide students with an increased level of hands-on activity, which has been proven to enhance learning.

To assist adult educators in developing similar types of lessons, an explanation of each of the components of the lesson has been provided. Teachers may review each component of one of the sample lessons as they read through the description below.

Identified Skill Gaps of GED Candidates
While this area was developed specifically to address data from the GED Testing Service, any adult education teacher can use existing assessment results to identify specific skill gaps among their adult education students. The Test of Adult Basic Education (TABE) and the Comprehensive Adult Student Assessment System (CASAS) both provide information on the skills assessed and teachers can use this information to identify specific skills that the majority of students in the class are lacking.

Content Area/Theme Identified by GED Testing Service Data Analysis
The GED Testing Service identified three thematic areas of concern for candidates who were not successful on the GED Mathematics Test. However, teachers in the adult education classroom may wish to use mathematics content areas, such as number and operations, geometry, measurement, data analysis and probability, and algebra.

NCTM Standards and Expectations
In 1989, the National Council of Teachers of Mathematics (NCTM) published its *Curriculum and Evaluation Standards for School Mathematics*, referred to as *NCTM Standards*. Since the release of the curriculum standards, additional documents have been published to support and expand the initial standards documents.

The *NCTM Standards* represents the national subject-matter standards for mathematics. The standards are divided by grade levels. However, each level emphasizes the need to extend the study of meaningful mathematics to all students.

The *NCTM Standards* are composed of ten Standards. The first five Standards present goals in the mathematical content areas of number and operations, algebra, geometry, measurement, and data analysis and probability. The second five Standards describe goals for the processes of problem solving, reasoning and proof, connections, com-

munications, and representation. These Standards describe the skills and understanding that students need to function effectively in the twenty-first century.

For a complete list of the *NCTM Standards*, access the *NCTM* website at: http://standards.nctm.org/document/index.htm.

Teachers should identify specific standards on which the lesson will be based. Standards should include both mathematical content areas as well as process standards. It is essential that process standards be incorporated into any mathematical activity, as that represents some of the most overwhelming shortcomings among adult education students, the ability to solve problems and communicate their ideas clearly to others.

Time Required for Activity

The sample lesson plans developed using this model require 1–2 class periods. Teachers should note that allowing students adequate time to explore and discover takes more time than does using a worksheet. Teachers should allow plenty of time to complete the activity.

Objectives/Learning Goals

In this section of the plan, teachers should include the skills they believe students will have when the lesson is complete. These skills should be specific, such as applying the Pythagorean theorem in real-life situations.

Prerequisite Knowledge

To participate in the lesson, students should possess specific skills or knowledge. In this section, include those skills that are essential if students are to be able to complete the lesson, such as knowing how to use linear measurements, or how to compute with decimals or fractions.

Content/Cognitive Skills

This section of the lesson pertains to the type of cognitive and/or content skills students will develop as a part of the lesson. For example, this lesson provides students with the strategy of substitution to solve for an unknown variable in algebraic problems.

Materials/Resources/Internet Sites/Handouts

List all of the items required to complete the lesson, whether they are tools, such as rulers and measuring tape, or handouts that include templates or questions that need to be answered.

Activity Procedure

Special Note: Adult education classrooms are often filled with students at multiple levels of competency in mathematics. Lessons developed with this format can be used in a variety of competency levels. With students working in teams, teachers have an opportunity to pair more advanced students with those who are struggling, allowing each to work to their own strength, but collectively to accomplish more. By using these lessons as a "whole class" activity, teachers will not have to worry about what to do with the students who are not involved in the activity.

Introduction to Lesson/Activity Starter

The lesson should begin with an attention-getting question or activity that will make the student think. It is best if the starter is real-life oriented and something familiar to students in their roles as a parent, family member, worker, etc. Students need to be able to make the connection between what they are going to learn and what they already know. Students also need to be able to answer the age-old question of "Why do I need to learn this?"

Example: If the lesson focuses on finding the area or perimeter of various shapes, the teacher may want to start with a question about when a student would need to find area or perimeter in real life.

Instructional Outline

This section of the lesson plan allows teachers to outline the activities that the student will be completing, as well as probing questions the teacher will need to use to help them explore. Take a few minutes to review the instructional outline for the lessons on ***Pythagorean theorem*** and ***Substitution*** provided as part of the National GED Mathematics Training Institute. Notice the types of questions that are used to guide students through the exploration process.

Teachers should help students learn how to develop their own questioning skills as they work through a lesson. Teachers can start with such questions as:

- What do we need to do first?
- Are there several options for us to use?
- Do you have a plan for how you want to approach the problem?

As students work through the exploration activity, ask questions such as:

- Do you see a pattern?
- What do you think will happen if…changes?
- Will this work, if you…?
- Why do you think this works this way?
- Does everyone agree with this answer, or do you think that there is a different answer? Why?

If the lesson is to be shared with other teachers, remember to include possible student responses for each question. This will help another teacher better understand your objectives for this activity.

Include activities that may require the use of calculators or the computer. Students need to be technology-savvy, and they need to learn when to use those tools to their advantage.

Evaluation

For GED students, one of the best evaluation tools is the *Official GED Practice Test.* The GED Mathematics Practice Test is filled with items that require students to take the knowledge they have and apply it to new situations. If the content is focused on a specific area within the GED Mathematics Test, then use practice test questions to evaluate whether or not students have mastered the skills taught during the lesson.

Instructors will also want to observe students engaging in problem-solving activities, ask them questions, and get them to explain their thinking. Observation and feedback are excellent ways to assess what a student knows and can do.

The Internet is also a wonderful place to find questions that can be used to evaluate whether or not students have mastered material. Use the Internet to find appropriately structured questions.

Use student-produced material as a way to evaluate the lesson. Have students construct their own questions and then test their classmates. Check first to make sure the question and answers are developed correctly.

GED-Type Question

The Official GED Practice Test Administrators' Manual includes sample questions for all areas of the GED Tests. Use sample questions from the manual or sample questions from older versions of the practice test for a final assessment of students before they take the GED Tests.

Including a GED-type question will help students make the connection between what they have learned and what they need to know for the test and will also give them practice in working with questions in the GED format.

Extension Activity

If time and student interest permits, include some extension activities that the student can complete independently or with a group. These activities can be set up for students to complete as homework and then shared the next day in class. Extension activities should focus on the application of skills in real-life contexts.

Special Notes:

In this section, include notes that you may need for yourself as you are teaching the lesson or notes that you believe would be helpful to another teacher.